FACT SHEET

NASA RESEARCH INTO PLANT NUTRITION HELPS EARTH VEGETATION

NASA research in the field of advanced life support technology in space has spawned a new science called *zeoponics*, offering mankind a superior plant nutrition system using naturally occurring minerals.

A Colorado company, ZeoponiX, Inc., of Louisville, is manufacturing ZeoPro™, a combination of a nutrient-charged zeolite and slowly dissolving substances that contain phosphorus and other nutrients. Zeolite is a naturally occurring mineral group consisting of over 50 different minerals. Made of a special crystalline structure that is porous, but remains rigid in the presence of water, zeolite can be adapted for a variety of uses. Plant nutrition is a major application. "Rather than man trying to second-guess the exact timing of nutrient needs for the plant, with zeoponics, the plant does the regulating of the nutrients as it needs them," explained Richard D. Andrews, ZeoponiX CEO. "With only the addition of water, plants will grow in the zeoponic medium for multiple growth cycles."

Benefits of using ZeoPro™ are numerous, according to Andrews. It makes grass grow better, as proven in an independent university test. Turf grown with the medium mixed into the root zone was found to have 100 percent quicker turf establishment, and this using half the normal fertilizer. Also, the grass was found to have more vigorous roots; in some cases the root mass was five time greater than that of grass grown in U.S. Golf Association (USGA) root zone specifications. ZeoPro™ delivers nutrients in a plant demand-driven fashion, a much more efficient way. The product also offers superior water retention and lower leaching levels.

NASA scientists at Kennedy Space Center and Johnson Space Center have been studying ways to sustain plant growth in space environments, since plants are considered critical to prolonged space exploration, supporting astronauts with water, oxygen, food, and to help recycle waste products as part of a regenerative life support system. Zeolite helped solve the problem of an efficient hydroponic system, and the term zeoponics was created. The zeoponic science is expected to be directly applied in the International Space Station and have applications for

ALS on future missions to extraterrestrial bodies, such as Mars and the moon. Plant growth trials have used similar zeolite-based technology on the MIR missions, including those involving U.S. astronauts. Zeoponic materials have also flown on Space Shuttle missions. Research is being performed at the Kennedy Space Center Biomedical Office's Advanced Life Support and Gravitational Biology (ALSGB) project on plant growth and productivity. Research at the Johnson Space Center Crew and Thermal Division's Advanced Life Support Integration Test Bed is focusing on developing specific zeoponic amendments for ground test and space applications.

A Small Business Innovative Research (SBIR) contract joined NASA and Boulder Innovative Technologies (BIT), to develop and improve zeolite products. ZeoponiX is a spinoff company from BIT, Andrews explained, and holds exclusive rights to this patented zeoponic technology. The company is bringing its benefits down to earth for use in turf, horticulture, and agriculture. Andrews and James W. Shaw, the president of ZeoponiX, Inc., explained that initial target market for ZeoPro™ in the first year was golf greens turf and specialty turf, such as playing fields. This encompasses over 16,000 golf courses, with over 400 new courses being added each year in the U.S. alone. Markets being entered include commercial greenhouses for floriculture, vegetable horticulture, and environmental horticulture (nurseries, tree farms, etc.). Differently formulated products are under design to specifically serve these markets. Consumer zeoponic products will include specialty fertilizers and growth mediums and potting mix blends.

Shaw pointed out the product is technically innovative and requires a period of education for the markets initially targeted. ZeoponiX has licensed the zeoponic technology to a firm in Australia and New Zealand. Other licensing inquiries have been received from firms in Asia and Europe. Distributorship arrangements have been established in many geographic areas of the U.S., as well as in Hong Kong, Singapore, and Malaysia. Other arrangements are in discussion or negotiation for the Mediterranean area, South America, and Canada.

The products are environmentally friendly and greatly reduce the release and loss of nutrients into ground water and runoff. This results in lower overall nutrient applied to achieve equal or superior plant growth and performance. A growing awareness and increasing environmental regulations are focusing on the overuse of fertilizers and the negative impacts on the environment. Zeoponics can help alleviate this problem.

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